

REMARKS

The Office action dated February 2, 2004 and the cited references have been carefully considered.

Status of the Claims

Claims 1, 2, 4-25, and 39-46 are pending.

Claims 1, 2, 4-25, and 39-46 are rejected as being unpatentable over Sugiyama (JP Publication 57-096,453; hereinafter "Sugiyama") in view of Lal (U.S. Patent 6,451,175). The Applicants respectfully traverse this rejection for the reasons set forth below.

Claim Rejection Under 35 U.S.C. § 103(a)

Claims 1, 2, 4-25, and 39-46 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Sugiyama in view of Lal. The Applicants respectfully traverse this rejection because Sugiyama's teaching clearly does not motivate one of ordinary skill in the art to use carbon nanotubes. Moreover, Sugiyama clearly discourages coating of the mixture on the electron emitter filament.

"[T]he legal conclusion of obviousness [under 35 U.S.C. § 103(a)] requires that there be some suggestion, motivation, or teaching in the prior art whereby the person of ordinary skill would have selected the components that the inventor selected and used them to make the new device." *C.R. Bard, Inc. v. M3 Systems, Inc.*, 48 U.S.P.Q.2d 1225, 1231 (Fed. Cir. 1998). Thus, a reference does not provide a motivation to select the elements of the claim if it warns against using them. *In re Gurley*, 31 U.S.P.Q.2d 1130, 1131 (Fed. Cir. 1994) ("A reference [is] said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.").

Sugiyama discloses that proper carbon fibers for his invention should have a thickness (the Applicants understand this term to be a diameter) between 10 microns and

90 microns. Translation of Sugiyama, paragraph 7, page 4. This dimension is on the order of 1000 times larger than the carbon nanotube diameter of the instant claims. Since Sugiyama discloses that a proper thickness of his carbon fibers should be on the order of 1000 times larger than carbon nanotubes, a person of ordinary skill in the art would be led away from using carbon nanotubes having a diameter in the range of nanometer, as is recited in claims 1, 2, 4-25, and 38-46. Similarly, one of ordinary skill in the art would not have considered Lal's carbon nanotubes to replace Sugiyama's carbon fibers because of Sugiyama's strong suggestion of using carbon fibers in the range of 10-90 microns.

Moreover, Lal merely discloses a method of making, and the good mechanical strength of, carbon nanotubes. Nowhere does Lal disclose or suggest electron emission property of carbon nanotubes. Therefore, in view of the fact that Sugiyama teaches away from using carbon nanotubes having nanometer sizes, a person of ordinary skill in the art would not have a motivation to use Lal's carbon nanotubes in Sugiyama's electrical device.

Since a motivation to combine Sugiyama and Lal is completely absent, claims 1, 2, 4-25, and 39-46 are patentable over Sugiyama in view of Lal.

In addition, Sugiyama teaches away from coating the carbon fiber mixtures on an electrode. Translation of Sugiyama, paragraph 2, page 2 (Sugiyama's invention "has an advantage of a long useful life for its having much emitter substance than an electrode in which the emitter substance is coated on the surface of a tungsten filament.") Therefore, there is no motivation to modify Sugiyama to coat the electrode filament with the electron emission mixture, as is recited in claims 1, 2, 4-25, and 43-46, because Sugiyama clearly teaches that coating is a much inferior structure. Therefore, one skilled in art, reading Sugiyama's admonition, would not have coated the electrode filament. Since Sugiyama teaches away from coating the electrode filament with the mixture, Lal's disclosure of carbon nanotubes becomes moot. Therefore, claims 1, 2, 4-25, and 43-36 are patentable over Sugiyama, even if Lal is considered.

The Examiner even admitted that "Sugiyama is silent to the composition containing carbon nanotubes", but asserted that "it would have been obvious . . . to construct the composition of Sugiyama, including carbon nanotubes, since Lal teaches this configuration

produces stronger and lighter compositions while maintaining excellent electrical properties." The Applicants respectfully traverse this assertion for the following reasons:

(1) Lal does not teach or even suggest a composition comprising oxygen-containing compounds of alkaline-earth metals and carbon nanotubes.

(2) Although Lal suggests that "[t]he utilization of nanotubes in composites now using carbon fibers can [] yield much lighter and stronger composites well suited for applications in the defense, aerospace and automobile industries" (Lal, column 1, lines 29-33), it is clear to one of ordinary skill in the art that, by this language, Lal refers to the mechanical properties of carbon fiber-reinforced composites, and not the electron-emitting property of the claimed composition. "[I]t is the invention as a whole that must be considered in obviousness determinations. The invention as a whole embraces the structure, its properties, and the problem it solves, [viewed in light of the teachings of the prior art]." *In re Wright*, 6 U.S.P.Q.2d 1959, 1961 (Fed. Cir. 1988). "Factors including unexpected results, new features, solution of a different problem, novel properties, are all considerations in the determination of obviousness in terms of 35 U.S.C. § 103." *Id.* at 1962. Therefore, the Examiner must consider the invention as a whole, including the invention's purpose to produce an electron-emitting composition with lower energy expenditure, and unexpected properties of the claimed invention, and compare those with the Lal reference. The claims must not be read in vacuum, but must be read in view of the specification. See; e.g., *Bocciarelli v. Huffman*, 109 U.S.P.Q. 385, 388 ("[I]t is not the normal function of a claim to disclose the invention, but to point out the features of novelty in the invention as disclosed in the specification and the drawing of the application.") Although the claim is given the broadest interpretation, that interpretation must have a basis in the specification. Therefore, the Examiner must determine the patentability of the claim in view of the specification and must not apply a reference that has no bearing on the claim to reject the claim. ("In order to rely on a reference as a basis for rejection of an applicant's invention [under 35 U.S.C. § 103], the reference must be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." *In re Oetiker*, 24 U.S.P.Q.2d 1443, 1445 (Fed. Cir. 1991). "It is immaterial to the issue of obviousness that elements of the claimed invention exist in other contexts." *The Gillette Co. v. S.C. Johnson & Son Inc.*, 16 U.S.P.Q.2d 1923, 1927 (Fed. Cir. 1990).)

(3) Although Lal mentions that “[t]he electrical properties of carbon nanotubes are also highly tunable. he [sic] tubes can be changed from semimetallic to semiconductive . . .”, this language does not suggest that carbon nanotubes be used in a mixture with alkaline-earth metals to render the electron emission from such a mixture easier, as is achieved by the instant invention.

Regarding claims 5-6, 16-17, 41-42, and 45-46, the Applicants respectfully traverse the Examiner's statement that “[o]ne of ordinary skill would be motivated to formulate this specific composition [of the claim] for a variety of reasons, including material availability.” First, as the Applicants stated above, Sugiyama teaches away even from coating the electron emitter with a mixture of carbon fibers and alkaline-earth metal oxides, let alone a mixture of carbon nanotubes and oxygen-containing compounds of alkaline-earth metals. Therefore, there is no motivation to use the claimed mixture of carbon nanotubes and oxygen-containing compounds of alkaline-earth metals, having any specific composition. Second, the issue is not a motivation for a variety of unspecified, unrelated, and theoretical reasons, but a motivation to make the claimed invention with an expectation of success; i.e., with a specific goal to solve a specific problem. *Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 56 U.S.P.Q.2d 1456, 1459 (Fed. Cir. 2000) (“[T]here must be a clear showing in the prior art for a likelihood of success for the claimed invention.”) There cannot be an expectation of success if there is not a specific goal for the invention.

Regarding claims 23-25, the Applicants respectfully traverse the Examiner's Official Notice that “a fluorescent lamp compris[es] mercury vapor and a background gas at a pressure of less than about 0.3 kPa.” As the Applicants stated above, Sugiyama teaches away even from coating the electron emitter with a mixture of carbon fibers and alkaline-earth metal oxides, let alone a mixture of carbon nanotubes and oxygen-containing compounds of alkaline-earth metals. Therefore, the Examiner's Official Notice coupled with the cited references still does not teach, suggest, or provide a motivation to make the claimed invention with all of the limitations recited in claims 23-25.

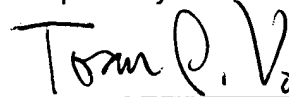
Regarding the Examiner's response to the Applicant's arguments, in paragraph 28 of the Office action, the Applicants respectfully point out that the Examiner has clearly misconstrued Sugiyama's disclosure. Sugiyama's Figures 1(a), 1(b), and 2 show that a pot (1) or a space formed inside a coil (1') is filled completely with the mixture of carbon fibers

and alkaline-earth oxides. The Applicants are at a loss as to how the Examiner can view these drawings as disclosing "an electrically conductive material coated with the mixture," given the ordinary meaning of the term "coated".

Regarding the Examiner's response in paragraph 29, the Applicants fail to see the Examiner's reasoning. In particular, the Applicants fail to see how the Examiner's statement that "[t]he current state of the art now shows that constructing nanotubes on the order of 50 nm is possible, and Sugiyama's recited carbon fibers are now relatively large" can logically lead to his conclusion "[t]herefore, . . . Sugiyama is disclosing that the proper carbon particles that are to be used in the fluorescent lamp are required to be relatively small, and therefore, does not teach away from carbon nanotubes." (Emphasis added.) First, the issue is not whether Sugiyama discloses any kind of carbon particles, but whether Sugiyama discloses or suggests carbon nanotubes. If Sugiyama had appreciated that smaller is better, he would have suggested to use smaller dimensions. The record shows that he did not do so. On the contrary, Sugiyama specifically and unequivocally states that "[a] proper thickness of the fiber is some microns—some ten (any number between 10-90) microns," thus warning against using anything smaller. Second, it is not disputed that carbon nanotubes on the order of 50 nm are possible (after all, "nanotubes" means tubes having a dimension on the order of nanometer), what the Applicants have argued is Sugiyama teaches away from using carbon nanotubes, i.e., tubes having dimension smaller than many micrometers.

In view of the above, it is submitted that the claims are patentable and in condition for allowance. Reconsideration of the rejection is requested. Allowance of claims at an early date is solicited.

Respectfully submitted,



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